

OPERATING MANUAL

TABLET HARDNESS TESTER SCHLEUNIGER 5Y

Version 4.22



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1 INTRODUCTION AND OVERVIEW OF 4.22 FEATURES

Welcome to the Schleuniger family. We hope you will find our products are of excellent quality, and that they will provide years of faithful service. Please read this manual carefully. It will provide you with all the information you need to operate the 5Y Tablet Hardness Tester.

This introduction provides a review of 5Y features and capabilities. You will find it useful in becoming familiar with the 5Y. Operating instructions are given in later sections.

Most words found in *italics* can be found in the Glossary at the back of the manual. These definitions are provided for your convenience.

1.1 General Information

Your 5Y will allow you to measure tablet breakage in *Newtons, Kiloponds, Strong Cobbs, or Pounds Apothecary*. Up to 100 measurements can be taken and stored for statistical analysis.

The 5Y computes the *Mean, Standard Deviation, Relative Standarddeviation, Minimum, Maximum, and Range* of your data. Statistical data may be printed in graphical form using the graphics option. You can define a valid range (*plausibility*) for measurements, which eliminates unacceptable values from the statistics.

The 5Y has three *Input/Output (I/O)* ports for communication with the outside world. The optional keyboard or *host-terminal* allows the user to enter product information, plausibility limits, and configuration information. The printer port connects the 5Y to any Epson compatible *serial* printer. A *host port* allows the 5Y to be attached to any serial terminal, allowing information to be passed between the 5Y and a host computer (hence, the term *host-terminal*).

Your 5Y has a powerful *micro-processor* based control board. The micro-processor controls the operation of the machine, and computes the statistics for the tablet measurements. The hardness readings are taken from a *load cell*, and converted into the appropriate units. Available unit scales are newtons, kiloponds, strong cobbs, or pounds apothecary. The units are set by means of a switch on the back of the machine. Refer to chapter 4.3 for conversion factors for the scales.

1.2 Printer and Statistics

An RS232 (serial) I/O printer port is a standard feature available on all 5Y testers. If a printer is connected, and configured, statistics are computed and printed for each test. Up to 100 tablets may be tested over a period of time, and included in a set of statistics. A set of statistics for up to 100 tablet readings will include:

- Product Name
- Product Number
- Batch Information
- A Comment
- Machine Calibration Date
- Date of the Test
- Time when the Test Begins
- Low Limit for Valid Measurements for the hardness
- High Limit for Valid Measurements for the hardness
- The Test Values (values outside the low-high limit are underlined)

When the Test is Complete, the 5Y will print:

- Test-Stamp Number
- Number of Valid Measurements Taken
- Mean Hardness
- Minimum Valid Measurement Hardness
- Maximum Valid Measurement Hardness
- Difference between Minimum and Maximum Valid Measurements Hardness
- Standard Deviation Hardness
- Relative Standard Deviation Hardness
- Up to 4 Graphs:

For less than 20 measurements, the 5Y will plot the:

- 1) Data Graph and
- 2) Histogram

For 20 or more measurements, the 5Y will plot the:

- 1) Group Data Graph,
- 2) Range Chart, and
- 3) Histogram

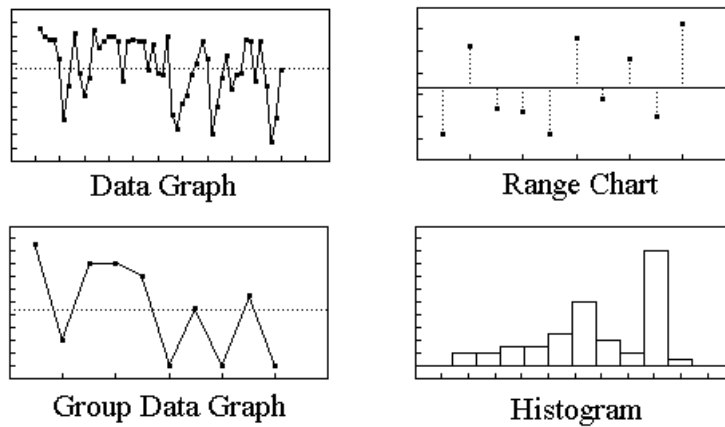
Optionally, for 20 or more measurements, the operator may cause the Data Graph to be plotted, in addition to the 3 normal graphs.

- The time when the Test is Completed

The Test-Stamp Number is printed with each graph, to help correlate multiple page printouts. The Test-Stamp may be reset to 1 when necessary.

See appendix G for examples of 40 and 80 column test statistics. The following figure shows examples of the four types of plots for hardness.

5Y Statistical Plots



The upper left plot is a graph of all the data in your set of samples. Each dot on the graph represents one sample. The dotted line across the graph is the average of all samples.

In the lower left plot, titled "Group Data Graph," each dot represents the average of five (5) samples. The first dot is the average of the first five samples, and so on. The line across the graph is the average of all the samples.

The Range Chart plots the difference between the highest and lowest measurement in each group of five values. The horizontal line across the graph is the average of the differences.

Finally, the Histogram shows the distribution of samples for a test. If a sample's hardness falls between two values, it falls in the bin corresponding to those two values. The bins are determined automatically depending on the highest and lowest measurements, and the maximum number of bins is ten (10).

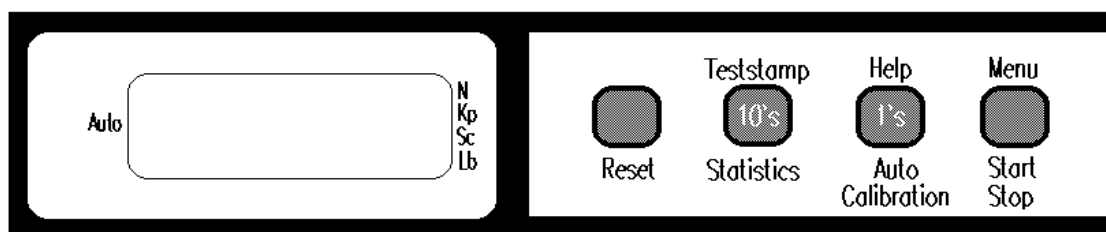
1.3 Host Terminal Port

A host/terminal RS232 (serial) port is provided to connect the 5Y to a computer or *dumb terminal*. A keyboard port is also provided. The keyboard is available from Schleuniger Pharmatron as an option. Any RS232 compatible serial terminal, tty, or modem can be attached to the host-terminal port, as long as the serial parameters (baud rate, etc.) are set correctly. The host-terminal or keyboard can be used to program the 5Y with configuration information.

1.4 Front Panel Buttons

Four panel buttons are provided on the front of the machine:

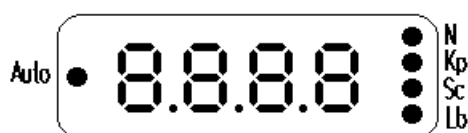
- 1 Reset
- > 2 Statistics - Time/Date - Teststamp - 10's
- > 3 Auto - Calibration - Help - 1's
- > 4 Start - Stop - User Menu



As you can see, three of the buttons have multiple functions. Read the section on **Machine Operation** to find out more about their functions. The RESET button restores the machine to power up condition, and all testing in progress is cancelled.

1.5 Front Panel Display

Measurement readings and other information are displayed on the red display panel. This display will also indicate which unit-scale the machine is configured for, and whether it is operating in Auto or Manual mode.



The 5Y red numerical display, with units and mode indicators.

1.6 Pressing Jaw



Tablets are placed in the jaw in the center of the machine. The right side of the jaw holds firm (the load-cell is behind it), and the left side moves out to break the tablet. Various jaw adapters are available for specific applications.

1.7 Summary of 5Y v4.22 Features

USER MENU

This feature allows configuration of the machine using either the front panel or the keyboard-host/terminal. Holding the START button for 2 seconds accesses the menu. When using a keyboard or host/terminal, you can access the user menu and other functions from the programming mode.

BUTTON OPERATION

All operations are accessed at the touch of a button. Multiple operations are accomplished by either pressing a button momentarily, or by pressing and *holding* the button.

GRAPHS

Statistical graphs are now plotted (when selected) on either a 40 or 80 column Epson compatible printer.

CALIBRATION VERIFY

Calibration may be verified, using any of the four units scales, without re-calibrating the machine.

CALIBRATION WARNING

If the machine was calibrated more than 6 months before the present date, the message "LAST CALIBRATION WAS MORE THAN 6 MONTHS AGO" will be printed after the header on each test printout. Schleuniger Pharmatron AG recommends re-calibration of the 5Y at least once every 6 months.

FASTER OPERATION

Tablets may be tested as fast as the operator can go. As many as 50 tablets in 5 *minutes*! The printer baud rate has been increased to 4800 baud, allowing faster printouts. (*Baud* is the term for *bits per second*, used when discussing serial communication speed.)

ADJUSTABLE TESTING PROCEDURE

During testing, the delay between each test and the "*backoff distance*" may be adjusted. The user can set these 5Y parameters for a "comfortable" testing procedure.

AUTOMATIC OPERATION

Tablet diameter is determined automatically. 999 is displayed when a test is started. The jaw moves out, and the first tablet is touched to determine the testing diameter. After that, testing proceeds normally.

TEST TRACKING

A Test-Stamp number (starting with 1) will be printed out with each test. This helps with multiple page printouts. The Test-Stamp number can be reset to 1 whenever necessary.

FACTORY DEFAULTS

Factory defaults may be restored by selecting User Menu item #10. This provides a quick method of configuring the machine quickly without setting each parameter individually.

EASY NUMBER SETTING

The 10's and 1's place of a number may be set separately, which is especially useful for large numbers. If you hold the 10's/1's buttons, the number will cycle through its possible values.

KEYBOARD FRIENDLY

All menu items may be configured from the keyboard or host computer. The current value of the entry is displayed when setting a parameter. Then, if ENTER is pressed, no change is made to the data. Thus, an operator can view the currently programmed values without modifying them.

AUTO UNIT LIMITS

When the units of measure are changed, and RESET is pressed, the lower and upper limits are set to the widest appropriate range for that unit. (For example, Strong Cobbs were chosen, the limits would be set to 0.1 and 56.7 on a 400 N machine.)

HELP

The user menu may be printed out for quick reference.

CONFIGURATION STATUS

The current machine configuration (or setup) may be printed out.

2 SETTING UP THE 5Y FOR OPERATION

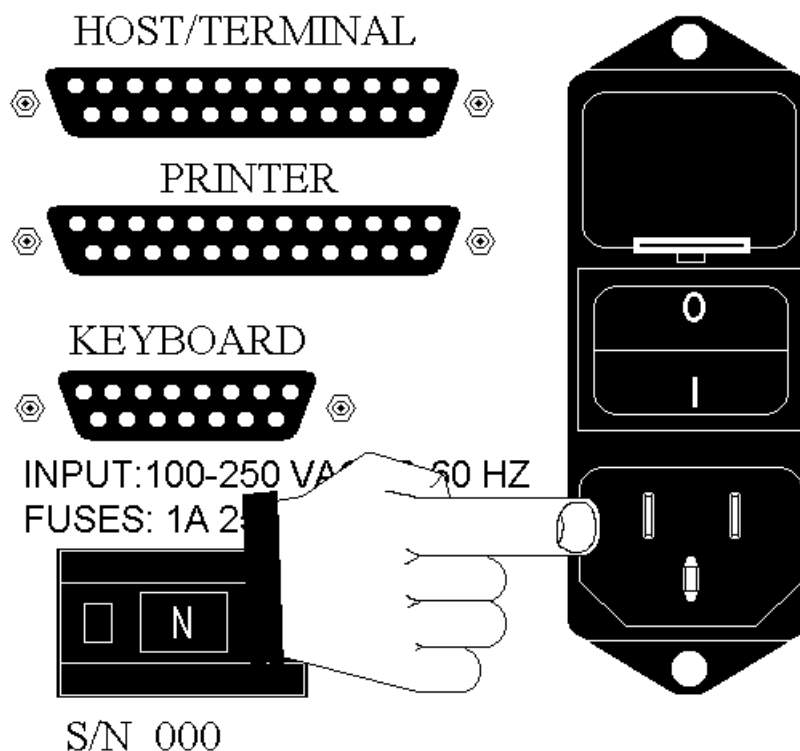
This section guides you through the general procedures involved in setting up the 5Y tablet hardness tester, along with optional peripherals. You may need a small screwdriver or other simple tools to aid in the setup of printer, keyboard or PC connection.

2.1 Power Cable Installation



The 5Y must be supplied with A/C power outlet. The appropriate cable for your power supply is included which also plugs into the back of the 5Y.

The AC power cord socket is located as shown here:



5Y A/C connector socket.

Make sure the power switch, located above the A/C socket is off. The number '0' will be displayed on the switch.

Plug the female end of the power cord into the A/C supply socket on the back of the 5Y. Plug the other end of the cable into the A/C power supply.

2.2 Connecting the Serial Printer

If you purchased the serial printer option, you can connect the printer with the 5Y for statistical printouts. The printer should be either a 40 or 80 column Epson compatible printer. For your convenience, several different types of printers are supplied by SPAG. You will need the appropriate cable for your printer. If you

purchased your printer from Schleuniger, the correct cable was included with your printer, and the printer was configured for the correct communication parameters before shipping.

Each printer has several options, which need to be set correctly for the operation to be successful. All settings were made prior to shipment, so you should only have to connect the printer and turn it on to begin using it. In the event that printer configuration is not correct, the following information will be useful.

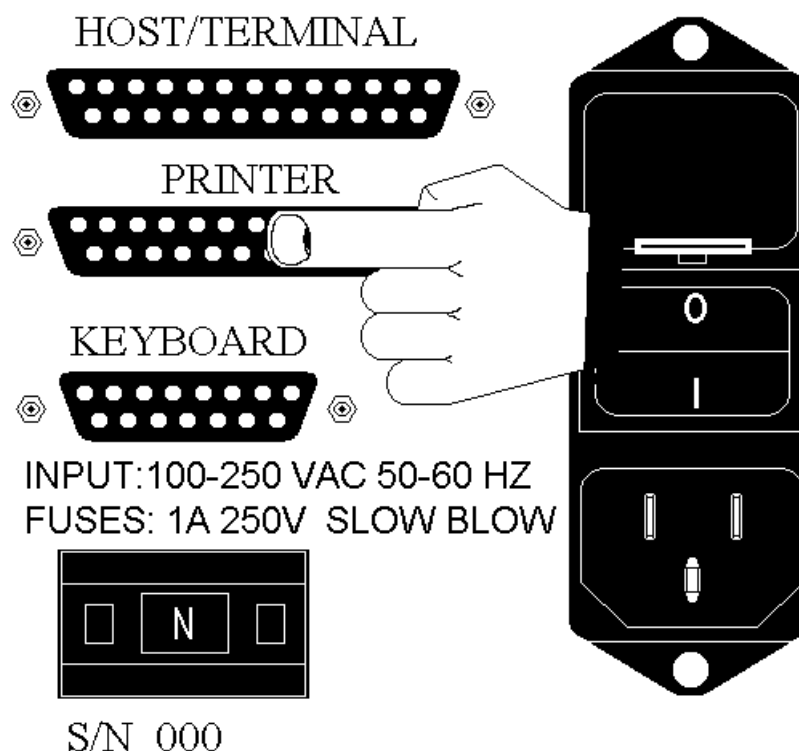
The 5Y uses the following serial parameters for the printer:

XON/XOFF protocol
4800 Baud (factory default)
8 Bits
No parity

* NOTE : The version 3.0 printer baud rate was 1200 baud, not 4800.

Connecting the Printer Cable:

The printer port on the 5Y back panel is located as shown here:



5Y Serial Printer I/O port.

Connect one end of the printer cable to the 5Y, and the other to the printer. Both ends of the cable should be the same, so you can connect the cable either way.

Make sure you secure the cable by tightening the screws on both ends. This will ensure that your data is not lost due to a loose connection. Plug the printer into a standard wall outlet.

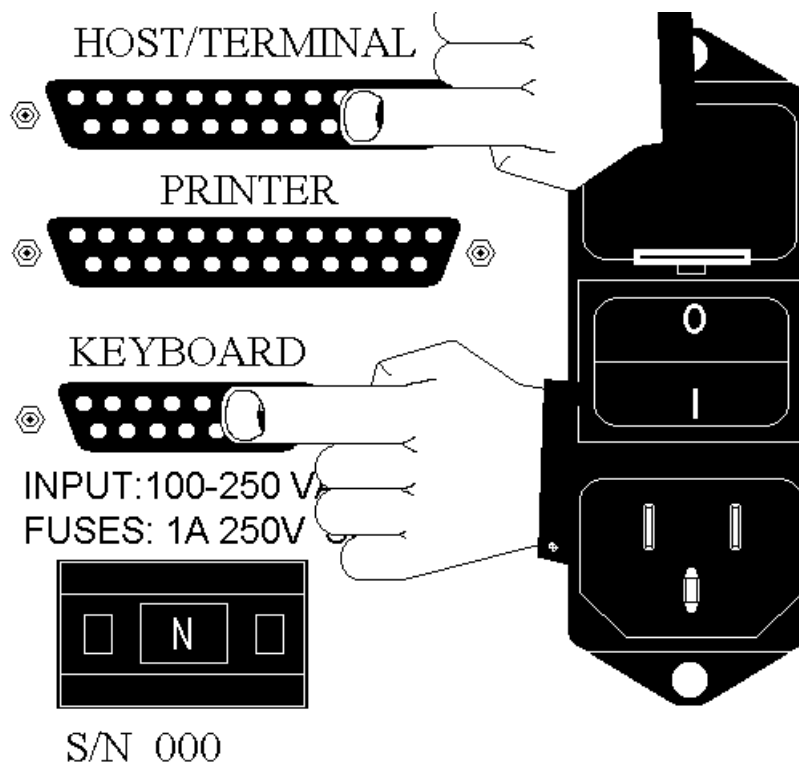
2.3 Connecting the Host/Terminal or Keyboard

If you purchased the keyboard option from Schleuniger, or you have a host/terminal, you can attach one to the 5Y. You can use either a keyboard or a host/terminal, but not both. The keyboard and host/terminal allow you to enter configuration information for tests.

You can operate the 5Y without a keyboard or host/terminal, and configure operating parameters with the front panel, but you can not enter high/low limits or product name, number, batch, or comment information.

Host/Terminal Connection

The Host/Terminal and Keyboard ports are located as shown here:



Host-Terminal and Keyboard Serial I/O ports.

The Host/Terminal cable is available from Schleuniger. Connect one end of the Host/Terminal cable to the 5Y, and the other end to your computer. The computer should be set up to communicate using: XON/XOFF, 1200 Baud, 8-Bits, No parity.

Keyboard Connection

Keyboard connection is simple. Plug the keyboard cable into the KEYBOARD port on the back of the 5Y. You may refer to the diagram on the

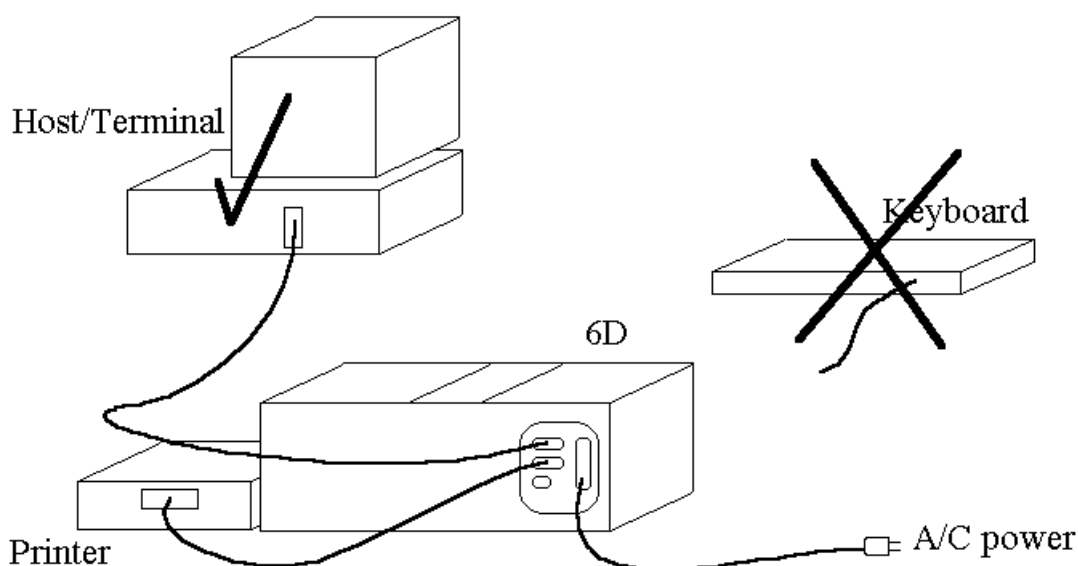
previous page for the location of the port. The port is also labelled on the back panel of the machine, for your convenience.

The keyboard supplied by Schleuniger uses the factory-default baud rate of 1200. The keyboard will not operate at any other rate.

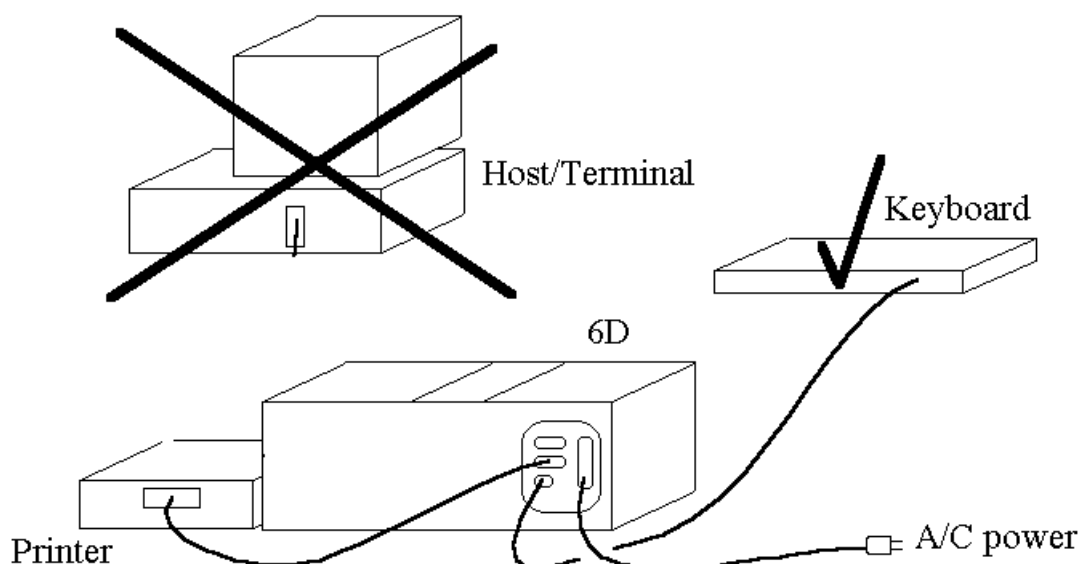
CAUTION! WARNING! NOTICE!



Do NOT connect both a keyboard and host computer to the 5Y at the same time! Only one or the other may be connected. If you connect both, there may be damage to BOTH the host and keyboard ports. The following diagrams depict the two possible configurations:



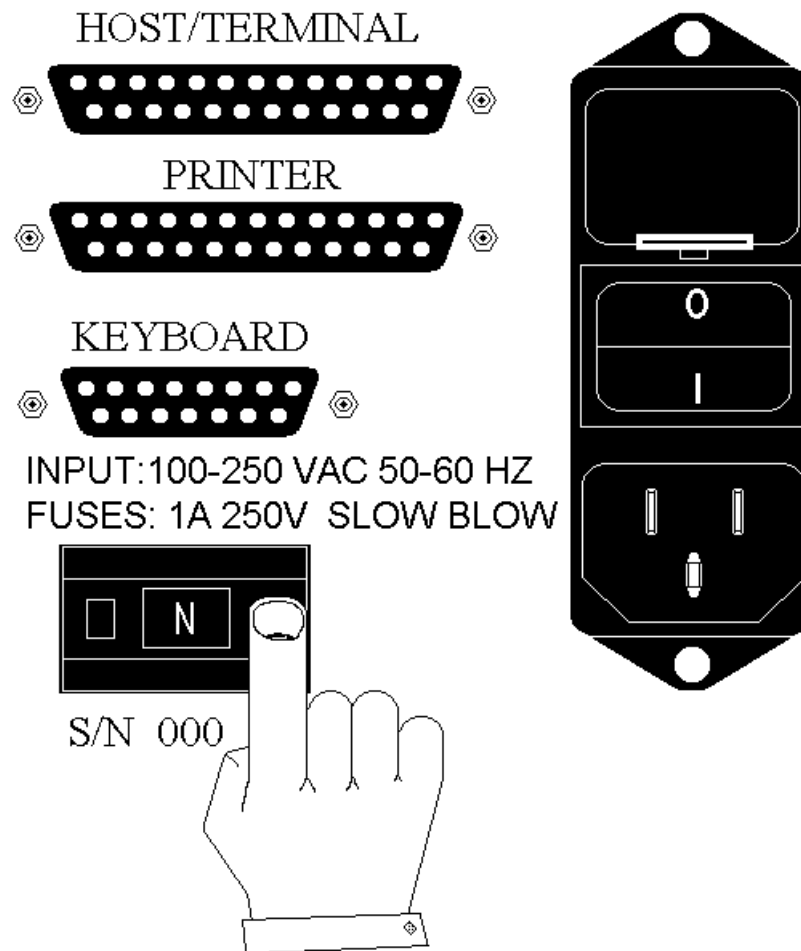
5Y with Computer (host) and Printer attached.



5Y with Keyboard and printer attached.

2.4 Setting the Units of Measure

The 5Y can measure hardness in Newtons (N), Strong Cobbs (Sc), KiloPonds (Kp), or Pounds (Lb). While looking at the back of the 5Y, you will notice a switch at the bottom of the peripheral connectors that has a little window. The window displays the present setting of the units. To change this setting, press one of the two buttons on either side of the window. You will hear a click, and the window will read a different unit.



Setting the Units of Measure on the back of the 5Y.

After setting the measuring units with the switch on the back of the machine, turn the machine on. If the machine is already on, press RESET to initialize the new measuring units. The Lower and Upper Limits for valid tests will automatically be reset to the widest range. See the section on Restoring Factory Defaults or Appendix C for the exact values. The machine is now ready to measure in the chosen units of measure.

* NOTE : The units of measure may be changed arbitrarily during calibration verification, without pressing RESET. However, after calibration verification, the user should return the units to the desired setting and press RESET to properly initialize the system.

2.5 Power ON

Your 5Y is now ready to power on. Turn on the power using the power switch on the back of the 5Y. The switch will read '1' when the machine is turned on. The '1' is on the bottom side of the switch, so you may have to look for it. You should also turn on all your accessory equipment at this time, if necessary.

3 MACHINE OPERATION

You can place a tablet in the jaw, and press start. The machine will work as shipped from the factory, without any user configuration. The factory defaults have been set so you can begin testing immediately.

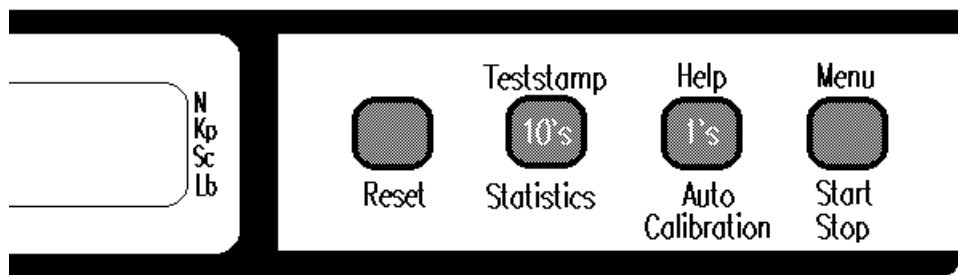
However, in the interest of being thorough, we must provide detailed information for those who wish to understand the complete workings of the 5Y hardness tester.

If you wish to begin operating the machine right away, you can go to the section titled "Performing a Hardness Test." There, you will be taken, step by step, through a test procedure.

3.1 Front Panel Operation Summary

We begin by reviewing the operation of the four panel buttons on the front of the 5Y.

The 5Y front panel has several functions. This picture shows the front panel buttons, with multiple labels near the 3 major function buttons. The three major functions are STATISTICS, AUTO, and START. Each of the three function buttons has other functions as well. These front panel functions are described here.



5Y Front Panel buttons, with new functions.

NOTE the new functions :

"Help" is above the Auto button. This button prints the operating instructions and the user menu, allowing you to quickly reference the User Menu functions.

"Menu" above the Start/Stop button, is used to access the User Menu. The User Menu allows you to configure the 5Y in various ways.

"Teststamp" is above the Statistics button. When held for 2 seconds, the teststamp variable stored in the 5Y will be reset to 1.

When setting numbers, the 10's and 1's digits of the number can be incremented independently. The 10's place is incremented by pressing the Statistics button. The 1's place is incremented by pressing the Auto button. This makes setting high numbers easy.

Appendix B contains a summary table of the panel functions. Here is some general information about each panel button.

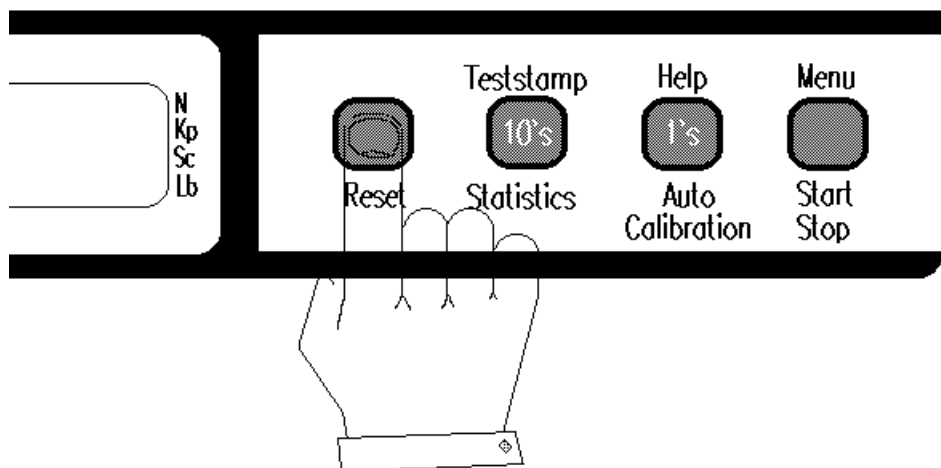
RESET - 1 Function:

- 1) Return the 5Y to power up condition.

The RESET button provides a hard reset. This is the same as turning the power off and back on again. When the machine is RESET, the statistical data is

initialized to zero, and the jaw is retracted to the "home" position. Pressing RESET causes the message "RESET" to be printed, if a printer is connected.

When RESET is pressed, the micro-processor inside the 5Y is immediately interrupted, and the control board performs some initialization functions. Then the micro-processor begins execution of the internal control software, starting at the beginning of the program.



To reset the machine at any time, simply press the RESET button. This restores the machine to the power-on condition, resets test data, and cancels any test in progress. It may also be used to immediately retract the jaw all the way back.

STATISTICS - 4 Functions:

- 1) Provides statistics during a test.
- 2) Sets 10's digits of a number being set.
- 3) Resets the Test-Stamp variable to 1.
- 4) Prints the measured data by calibration verification

The STATISTICS button is normally used during testing. If you have taken at least 1 valid measurement, the statistics will be printed. The data is initialized to prepare for a new test.

If no test values have been taken, the message "No Statistics Available" will be printed. If no peripherals are attached, nothing happens.

During number setting (See the section on NUMBER SETTING), it increases the 10's digit of the number being set.

If you hold this button, the Test-Stamp variable will be reset to 1.

AUTO - 3 Functions:

- 1) Toggles AUTO mode ON-OFF.
- 2) Sets 1's digit of a number being set.
- 3) Prints out the HELP menu when pressed and held for 2 seconds.

The AUTO button is used to toggle Auto and Manual modes of operation.

If you hold this button, the 5Y will print out a HELP menu on the attached printer. The menu contains a list of all the options contained in the user menu. Default values have an asterisk (*) next to them. These are the values that are used when factory default settings are restored.

During number setting, the AUTO button increments the 1's place of the number being set.

START/STOP - 3 Functions:

- 1) Begin or Stop a test.
- 2) Access the User Menu.
- 3) Finish an operation.



The START button is used to begin or suspend a test. When you begin a test, you place a tablet in the jaw, and press START. The number 999 will be displayed, and the jaw will move out. When the tablet is touched, the diameter will be stored, and the slide will retract "Back-Off " a preset number of millimeters. (See the section on "Setting Backoff Distance" for more information.) It will then move forward slowly and break a tablet. The jaw then retracts to the *resting position*. If the machine is in Automatic mode, it will wait a preset number of seconds. (See the section on setting *Test-Delay* for more information.). The 5Y will then press another tablet.

When the machine is in Automatic mode, you can press START/STOP any time, and the test will pause after the measurement is taken. You can restart the test by pressing start again, or press STATISTICS to finish the test prematurely.

Holding the START button for 2 seconds accesses the USER MENU. After you set the menu number you want, START selects the displayed menu number.

During number-setting, pressing START/STOP ends the number-setting routine.

Most operations are completed by pressing START/STOP.

* Special Note:

If you press and hold START, just as the statistics begin printing, and you have tested 20 or more samples, the data graph will be printed along with the group data, range and bar graphs. You can release start after the data graph begins printing.

3.2 Setting Numbers with the Front Panel

When a number *prompt* is displayed, the 5Y will expect the user to set the number on the RED display. To increment the ones digit, press AUTO. To increment the tens digit, press STATISTICS. When you are finished setting a number, press STOP. You can hold either 10's or 1's to continuously cycle the numbers.

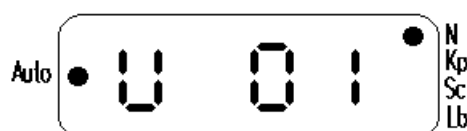
You can not exceed the allowable value for a number. For example, the maximum logical value for hours is 23, and the minimum is 0.

Example:

Here, we access the User Menu, and select menu item #1, "set number of valid measurements."

(1) Press and hold START

The display will show

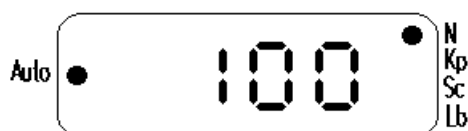


(2) Release START

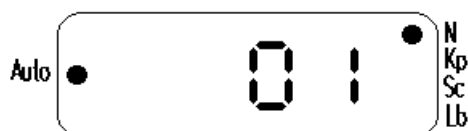
(* NOTE : The lights next to "N" and "Auto" are lit, indicating that the machine is set to Automatic Mode and Newtons Scale. Your machine may be set to another scale, or may be in Manual Mode. See the section on "Setting up the 5Y for Operation" to find out how to change the units scale. See the section on "Setting Auto/Manual Mode" to find out about the Auto light.)

(3) Press START again to select "set valid number of measurements."

The factory default for the valid number of measurements is 100. Thus, the display should look like this. If your display reads something different, that's okay. Just press STAT or AUTO to see what happens:

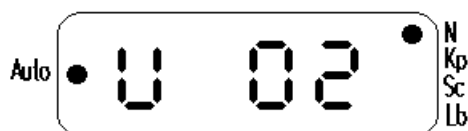


(4) Press STATISTICS to increment the 10's digit.
The display will show:

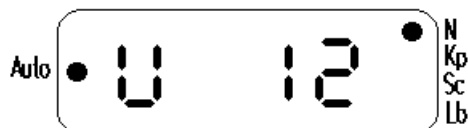


The display has "wrapped around" to the minimum allowable value, which is 1. Note that you could not have incremented the 1's digit when 100 was displayed, since the number 100 is the maximum allowable value.

(5) Press AUTO to increase the 1's digit. The display will read



(6) Press STATISTICS. (increase 10's) The display will read



(7) Press STOP. (complete operation)

The machine will now display either 000 for N. or 00.0 for Kp, Sc, or Lb. This completes the number-setting operation. We have set the valid number of measurements to 12. Feel free to play around with the menu until you are comfortable using it. You can always restore the Factory Defaults later!

NOTE : All numbers will automatically be kept within their logical ranges. Some confusion may occur at the minimum and maximum allowable values. When the value has reached its maximum, it will wrap back around to the minimum value. You may have to press either 10's or 1's to accomplish this, depending on the range of the value being set.

3.3 User Menu and Programming Mode

A User Menu is provided to allow configuration of user operating parameters. The user menu can be operated from the 5Y front panel buttons, or from a keyboard or host/terminal.

Listed here are the 10 user menu items. Related items are grouped together.

The menu choices are:

U 01. Set the Valid number of measurements.

U 02. Set the Time and Date, which is stored in the battery powered clock chip.



U 03. Machine Calibration.

U 04. Calibration Verification.

U 05. Select the Printer Type (OFF / 40 column / 80 column).

U 06. Setup Graphs (OFF / Graphs Only / Data & Graphs).



U 07. Set the "Backoff Distance", which is the distance that the slide moves away from the tablet after taking a hardness reading.

U 08. Set the delay between each test in AUTO mode.

U 09. Print the currently configured parameters.

U 10. Restore the Factory Default Settings.

U 11. Insert highest and lowest plausibility limits

U 12. Setup Mechanical Tablets

U 13. Run Mechanical Tablet Test

The Host-Terminal or Keyboard allows you to enter 5Y programming mode. When you are in programming mode, you can access all the User Menu items, and enter test information.

NOTE : All parameters are stored in battery backed RAM, and are preserved when the main power is turned off.

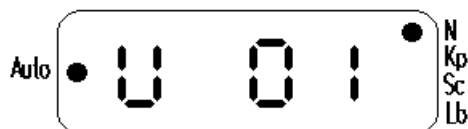
3.4 How to Operate the User Menu and Programming Mode

If you have a keyboard or host/terminal, you can use the 5Y programming mode, which also accesses the user menu. However, if you do not have a keyboard or host/terminal, you can only access the user menu from the front panel, and you can not use the programming mode.

3.4.1 With the Front Panel - User Menu

1) Press and hold START/STOP for 2 seconds.

2) The display will show 'U 01'



- 3) Use STATISTICS and AUTO (10's and 1's digits) to set the desired menu number.
- 4) Press START/STOP to select the menu item.
- 5) Follow the procedure in the section "How to Use Each Menu Item" for the menu item you select.

3.4.2 With the host/keyboard - Programming Mode

- 1) Press the ESC key to enter Programming Mode.
The Keyboard display or Computer screen will display the message:

Programming mode : <RETURN> => Exit
- 2) Press the number 1, 2, 3, 4, 5, 6, 7, 8, 9, or 0, corresponding to menu items 1 through 10, respectively.
- 3) Follow the procedure for the appropriate menu item.

Note that 6 other options are available using the keyboard during programming mode. They are:

| <u>Function Key</u> (alternate character) | <u>Parameter</u> | <u>Allowable Values</u> |
|--|-------------------|-------------------------|
| F1 (or n) | Product Name | Up to 23 characters |
| F2 (or #) | Product Number | " |
| F3 (or b) | Batch Information | " |
| F4 (or c) | Comment | " |
| F5 (or l) | Low Limit | Number from 0 to Max |
| F6 (or h) | High Limit | " |

Pressing CTRL-C (hold CTRL and press C), while in programming mode, resets the product name, product number, batch information, and comment to all periods ("....."). The low and high limits are set to minimum and maximum for the selected scale (N, Kp, Sc, Lb). See the table in appendix C for information on the low and high limits.

Max is the highest value for the current units of measure that converts to 405 or 505 Newtons, whichever applies to your machine. For example, if the scale is Strong Cobbs, Max is 56.7 on a 400 Newton machine.

You can press either the function key or the alternate character (lower case) to edit the corresponding item. The alternate character method (letters n, #, b, c, l, and h) is available for host-terminals that do not transmit the correct code for the function key. The Schleuniger keyboard does transmit the correct codes, so you use the function keys with the keyboard.

NOTE : These test parameters are printed with each set of measurements. If you don't have a keyboard or host/terminal, you cannot modify these parameters. The entries are set to periods (".....") at the factory before shipping.

3.5 Printing the Help Menu

If you have a printer connected, you can print out the help menu. To print out the help menu:

- 1) Press and HOLD the HELP button until the menu starts printing out.

That's it! The help printout is useful to remind you of the user menu functions without having to get out the manual.

3.6 How to Use Each Menu Item

3.6.1 Menu U 01. Setting the Number of Valid Measurements

When you perform a test, you need to specify the number of samples you wish to include in the statistics.

The lower and upper limits (see appendix C) determine whether a sample is included in the statistics. If a sample's hardness is between the lower and upper limits, it is considered a "valid" sample, and is included in the statistics. Values outside the lower and upper limits are not included in the statistics, and are considered "invalid." Invalid values are underlined on the printout.

For example, if you wish to test 20 tablets, you set the number of valid measurements to 20. You may need to test more than 20 tablets to get 20 valid values.

Example:

Let us say you have the following low and high limits:

Low = 100 High = 150

and the number of valid measures is:

Number of valid = 5

You then take the following data samples:

125 130 155 90 149 99 100

In this case, 125, 130, 149, and 100 are valid samples, while 155, 90, and 99 are not. You still need one more valid sample to complete your test.

To set the number of valid values the 5Y will accept:

(The minimum value is 1, the maximum value is 100)

With front panel

- 1) Press and HOLD Start. This accesses the User Menu.
- 2) When the display shows 'U 01', press start again. You have selected

item #1.

- 3) The display will show the current number of valid measurements.
- 4) Use the 10's and 1's buttons to set the desired number, if you wish.
- 5) Press STOP. The display will read 000 or 00.0

With the keyboard

- 1) Press "ESC". The keyboard display will show the programming mode prompt:

Programming mode : <RETURN> => Exit

- 2) Type '1' (NOT the F1 key). The keyboard display will show:

Number of Valid : (X)

Here, (X) is the currently configured value.

- 3) If you do not wish to change the value, you can press "ENTER" to keep the current value. If you wish to change the value, type the desired value.
- 4) Press ENTER. This returns you to the programming mode prompt.
- 5) If you are finished with programming mode, press ENTER again to exit programming mode. The keyboard display will show:

<DONE>

to indicate that you have finished programming.

3.6.2 Menu U 02. Setting the Time and Date

The 5Y has an internal clock with crystal synchronization. It should only need to be changed for daylight savings time or if the date/time are wrong. The date and time are maintained by the 5Y's internal battery.

The time is stored in 24 hour format where 0 is 12 o'clock midnight, and 23 is 11 o'clock pm. The date is stored as day, month, year, and weekday. The weekdays are numbered 1 through 7, which correspond to Sunday through Saturday.

You can use this procedure to examine the 5Y date and time. Just step through the values without changing them.

With front panel

* NOTE : If you don't want to change a value, just press STOP to continue to the next value.

- 1) Access the user menu (press and hold start).

- 2) Choose item #2. You do this by setting the number on the display to read "U 02". Then press START. The display shows the Minute value.
- 3) Set the Minute, Press STOP. The display will show the hour.
- 4) Set the Hour, Press STOP. The display will show the weekday.
- 5) Set the Weekday (1 = Sunday, 2 = Monday, etc...), Press STOP. The display will show the day of the month.
- 6) Set the Day of The Month, press STOP. The display will show the month.
- 7) Set the Month, press STOP. The display will show the first 2 digits of the year. (i.e. 19)
- 8) Set the first 2 digits of the Year, press STOP. The display will show the last 2 digits of the year. (i.e. 98)
- 9) Set the last 2 digits of the Year, press STOP. The display will return to 000 or 00.0

With the keyboard

* NOTE : If a value does not need to be changed, just press 'ENTER' to continue to the next value.

- 1) Press "ESC" to enter programming mode. The keyboard or terminal will display:

Programming mode : <RETURN> => Exit
- 2) Type '2'. The keyboard or terminal will show

Minute: (X) where (x) is the current value.
- 3) Type the value, if you want to change it, or don't type anything. Press ENTER when you are done.
- 4) Go through the rest of the values:
HOUR
WEEKDAY (1= Sunday, 2 = Monday, etc...)
DAY-OF-MONTH
MONTH
and YEAR. (4 digits)
- 5) Press 'RETURN' after typing each value. The display will show the current value for each parameter.

3.6.3 Menu U 03. Machine Calibration

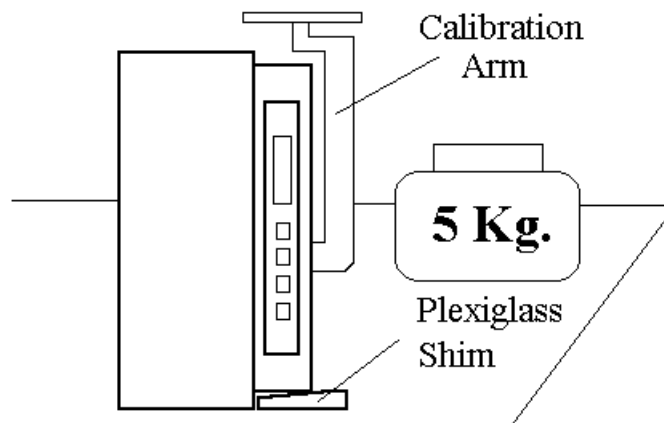
i

Schleuniger recommends that you have your 5Y calibrated at least once every six months. Six months after the calibration date, the message „Calibration was more than 6 months ago“ will be printed on every test. To perform a calibration you need a calibration arm and a 5 kilogram weight stone (to set the hardness sensor). If you do not have these items you may order them from Dr. Schleuniger Pharmatron AG.

Do not attempt to calibrate the 5Y if you don't have a calibration kit. Activating the calibration routine will make your unit unusable until it is properly calibrated.

To perform a calibration:

- 1) Remove the Anvil Head. This is the right-hand part of the pressing jaw. It is easily removed by grasping it in the indents and pulling firmly to the left.
- 2) Place the machine in the position on a very stable workbench as shown here:
 - a) Place the plexiglass shim below the right side of the 5Y.
 - b) Make sure the machine is steady.
 - c) Place the calibration arm on the shaft where the anvil was removed as shown.



*The 5Y in calibration position.
Have the 5 Kg. weight standing by...*

* NOTE : You should avoid touching or bumping the machine or table during the calibration procedure.

With front panel

- 3) Access the User Menu.
- 4) Choose item #3. The display will flash "0000". You may abort the the calibration procedure at this point by pressing RESET or turning the power off.
If you wish to proceed, press the button on the front panel marked CALIBRATION.
- 5) The display will show "7 00".

- 6) After a few seconds, the display will show '00.0'. At this point, the 5Y is taring the calibration arm to zero.
- 7) After a few more seconds, the display will read '05.0'. This is your cue to place the 5 Kg. weight on the calibration arm. Do this now. Wait until the weight has stopped moving, and is completely stable. You may need to use your hands to stabilize the weight more quickly.
- 8) Press CALIBRATE. To avoid unnecessary movement of the 5Y, squeeze the calibration button with your thumb while supporting the 5Y with your index finger inside the pressing chamber.
- 9) After you press CALIBRATE, you may remove or add weight. The display will continuously read the value in kiloponds.
- 10) Remove the 5 kg weight and calibration arm. Place the 5Y back in its normal position.
- 11) Reinstall the anvil head. NOTE: Make sure the anvil head is pressed securely onto the shaft. An improperly seated anvil head will result in erroneous hardness readings.
- 12) To complete the calibration routine, press and hold the start button for two seconds. The display will return to „00.0“ or „000“ depending on the unit of measure selected.

With the keyboard

- 3) Press "ESC" to enter programming mode. The keyboard or terminal will display:

Programming mode : <RETURN> => Exit
- 4) Type '3'. The keyboard will display „To calibrate, enter ‘yes’, or press any other key to exit....“ Type ‘yes’ to continue.
- 5) The 5Y display will read '7 00'.
- 6) After a few seconds, the 5Y display will show '00.0'. At this point the 5Y is taring the calibration arm to zero.
- 7) After a few more seconds, the display will read '05.0'. This is your cue to place the 5 kg weight on the calibration arm. Do this now. Wait until the weight has stopped moving and is completely stable. You may want to speed up this stabilization by steadying the weight with your hands.
- 8) Press ENTER.
- 9) After you pressed ENTER, you may add or remove weight and see the appropriate value displayed in kiloponds.

- 10) Remove the 5 kg weight and calibration arm. Place the 5Y back in its normal position.
- 11) Reinstall the anvil head. Note: Make sure the anvil head is pressed securely onto the shaft. An improperly seated anvil head will result in erroneous hardness readings.
- 12) To complete the calibration routine, press 'ESC'. The display will return to „00.0“ or „000“ depending on the unit of measure selected.

A few notes about the calibration routine:

- The calibration routine only reads kiloponds.
- During calibration verification, any units scale may be used.
- The calibration is sensitive to vibrations. Keep the machine steady.

WARNING: DO NOT drop the 5 Kg. weight onto the stand. This may damage the load cell permanently.

3.6.4 Menu U 04. Calibration Verification



The 5Y is a sensitive measuring instrument, it may be desirable to verify the calibration accuracy periodically. The Hardness can be verified in any of the four units of measurement.

Schleuniger Pharmatron recommends the use of precision gage blocks and weights to test the calibration over the range of the machine. See appendix C for conversion factors for the various units of measurement.

To verify hardness, set the machine in the calibration position as described in the calibration routine (U 03).

With the front panel

- 1) Press and hold the START button to access the user menu.
- 2) Choose item #4.
- 3) If you wish to print a verification report, press STATISTICS at this time.
- 4) Perform the verification routine by placing various weights on the calibration arm. The display will show the readings in whatever unit of measure was selected. Press STATISTICS to print the displayed reading.
- 5.) Place the machine back in the normal operating position.
- 6) Replace the pressing jaw.

- 7) Press and hold the start button to leave the verify mode. The machine will return to normal operation.

With the keyboard

- 1) Enter programming mode by pressing ESC. The keyboard or terminal will display:
Programming mode: <RETURN> => Exit
- 2) Type '4'. The keyboard display will show:

 <| Calibration Verify |>
- 3) If you wish to print a verification report, press 't' (lower case only) at this time.
- 4) You will be prompted with the message „Enter Target Value“ to input a target weight. Enter this weight then press ENTER.
- 5) Perform the verification routine by placing a weight on the calibration arm. The display will show the reading in whatever unit of measure was selected. Press 't' to print the displayed reading. Both the target and actual weight will be printed at this time.
- 6) Continue placing as many different weights as you wish. You will be prompted for a target weight each time.
- 7.) Place the machine back in the normal operating position.
- 8) Replace the pressing jaw. Make sure it is firmly seated on the shaft.
- 9) Press 'ESC' to leave the verify mode and ENTER to quit the programming mode. The machine will return to normal operation.

3.6.5 Menu U 05. Selecting Printer Setup

We have provided the capability to select a printer type, or to disable printer operation. Disabling the printer is desirable, when you *do not* have a printer connected. If you have a printer, connect the printer to the 5Y, and enable the appropriate printer number. There are three selections for printer type: 0 means no printer, 1 means you have a 40 column printer, and 2 means that you have an 80 column printer.

If you don't configure the correct printer, you will get errors when the 5Y prints information.

If you don't have a printer, you can disable the printer routines, which saves time when starting and completing tests. The 5Y will only perform printer operations, such as graph computations, when a 40 or 80 column printer is selected.

If you are not using a printer, you should definitely disable printer operations. Otherwise, the machine will compute and attempt to plot the graphs, even though no printer is connected! This will take some time, and the machine will not be useable during this time.

After you select the printer type, the 5Y will prompt for the baud rate setting. This allows adjustment for slower printers.

With the front panel

- 1) Access the user menu by holding START.
- 2) Choose item #5.
- 3) Select 0 to disable the printer. This bypasses all printer routines.
Select 1 to enable a 40 column printer.
Select 2 to enable an 80 column printer.
- 4) Press START. The display will show 0, 2, or 4.
- 5) Set the baud rate:
0 = 1200 baud. 2 = 2400 baud. 4 = 4800 baud.
Other numbers are not valid, and result in a setting of 2400.
- 6) Press STOP. The 5Y display will show 000 or 00.0

With the keyboard

- 1) Enter programming mode by pressing the ESC key.
- 2) Type '5'.
- 3) Type the desired value (0 = no printer, 1 = 40 column, 2 = 80 column).
- 4) Press ENTER. The display will prompt for the baud rate setting.
- 5) Type number corresponding to the desired baud rate:
0 = 1200 baud. 2 = 2400 baud. 4 = 4800 baud.
- 5) Press ENTER to return to programming mode.

To test your printer configuration, make sure the printer and 5Y are turned on. Then press RESET, followed by START. You should get a properly formatted header, and some information. After the header prints, press RESET again to stop the test immediately.

If your header is not printed correctly, you should go back and make sure you have configured the correct printer.

* NOTE : The Brother M-1109 and Centronics GLP-II must be operated at 1200 baud. See the section "Connecting the Serial Printer" for more information.

3.6.6 Menu U 06. Selecting Graph Style

The 5Y graph plots can be disabled, set to print out graphs only, or set to print out both the graph data and the graphs.

If graph plotting is OFF, the 5Y will compute and print ONLY the statistics. No graphs will be plotted.

If the graph style is set to Graphs-Only, the 5Y will print the statistical summary, then print only graphs. No graph data will be printed.

When you set the 5Y to print both graphs and graph-data, the points plotted in the graph will be printed out for comparison with the graphs.

Note that the 5Y will always print out each individual sample during the test, if printing is turned on (see Selecting Printer Setup).

With the front panel

- 1) Access the user menu by holding START.
- 2) Choose item #6.
- 3) Select 0 to turn Graph plotting OFF.
Select 1 to turn on Graphs Only.
Select 2 to turn on Graphs & Graph Data.
- 4) Press STOP.

With the keyboard

- 1) Enter programming mode by pressing the ESC key.
- 2) Type '6'.
- 3) Enter the desired number.
(0 = Graphs OFF, 1 = Graphs only, or 2 = Graphs and Graph data)
- 4) Press ENTER to return to programming mode.

3.6.7 Menu U 07. Setting Backoff Distance



When the 5Y begins a test, the slide moves forward until it contacts the tablet. At this point, it stores the tablet diameter. The *backoff distance* is added to the tablet diameter to determine the *resting position* to use between each test sample.

After computing the resting position for the test, the slide will move forward, at slow speed, to break the tablet. After breaking the tablet, the slide returns to the resting position.

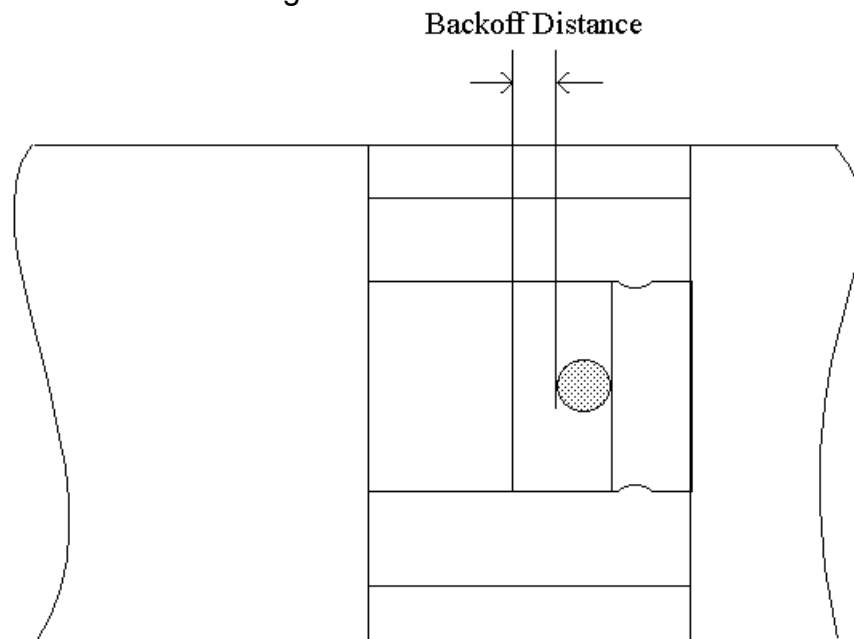
The backoff distance may be set by the user. It is measured in 0.1 millimeter increments. The 5Y has an approximate accuracy of plus or minus 0.06 mm. The displayed measurement is only intended to provide an approximate value to help the user set the backoff parameter.

Note that you can set the backoff distance without a tablet. The value is stored as a *difference* from the actual diameter, so the actual diameter is irrelevant.

If you do not wish to change the backoff distance, you can leave the setting at the factory default of 3.0 millimeters.

This parameter, along with the *test delay* parameter (see the next section), will allow you to set up a comfortable test cycle. If the operator can replace tablets quickly and accurately during testing in Auto mode, you may want to set the backoff distance to a small value. On the other hand, you may want to leave lots of room to work. The following figure gives a pictorial view of the backoff distance. The slide is

in the RESTING position (not reset), where it is waiting between subsequent hardness measurements during a test.



The backoff distance is added to the pill diameter to determine the resting position.

With the front panel

- 1) Access the user menu by holding START.
- 2) Place a sample in the tester's jaw.
- 3) Select item #7.
- 4) The slide will move forward, stopping when the sample is contacted.
- 5) Press and hold the STATISTICS button to move the slide to the left.
Press and hold the AUTO button to move the slide to the right.
Adjust the spacing. The 5Y display will read millimeters.
- 6) Press STOP when you are done.

With the keyboard

- 1) Press the ESC key to enter programming mode.
- 2) Type '7'.
- 3) The slide will move forward and contact the sample.
- 4) Hold the STATISTICS button on the front panel to move the jaw, or the AUTO button to move the jaw right.
- 5) Press STOP on the front panel when done.

Note that if you attempt to press the tablet, while setting the backoff distance, the slide will retract a millimeter or so, and re-establish contact with the tablet.

Please wait until contact is re-established before setting the distance. This prevents accidental fracture of the tablet.

3.6.8 Menu U 08. Setting the Delay Between Tests

When the 5Y is in AUTO mode, it waits a fixed time between each measurement. This delay may be set, by the user, to a value between 0.5 seconds and 5.0 seconds. Users may wish to experiment with the setting to obtain an acceptable delay.

With the front panel

- 1) Access the user menu by holding START.
- 2) Select item #8.
- 3) Set the value using 10's and 1's.
- 4) Press STOP when done.

With the keyboard

- 1) Enter programming mode by pressing the ESC key.
- 2) Type '8'.
- 3) Type the desired value.
- 4) Press ENTER.

3.6.9 Menu U 09. Printing the Current Setup

When the 5Y is shipped from the factory, a set of default values is programmed into the machine (see Restoring Factory Defaults). The user may print out the current setup.

* NOTE : A printer must be connected, turned on, and the Printer configuration value must be set to either 40 column (1) or 80 column (2), for this selection to work.

With the front panel

- 1) Access the user menu by holding START.
- 2) Choose item #9.
- 3) Press STOP.
- 4) The configuration will be printed.

With the keyboard

- 1) Enter programming mode by pressing ESC.

- 2) Type '9'.
- 3) The configuration will be printed.

Here is an example printout:

```
-----\\/\--\\/\-----\\/\--\\/\-----
The 5Y Configuration is:
    Date: 18/11/2003
    Time: 10:40
Cal. Date: 11/11/2003
    Printer: 80 column
    Graphs: Graphs & Data
    Backoff: 1.5 mm.
    Delay: 0.5 sec.
L. Limit: 1
H. Limit: 405
# Valid: 100
Units: N

....Part #xxxxxxx (number stands for sw version)
-----\\/\--\\/\-----\\/\--\\/\-----
```

3.6.10 Menu U 10. Restoring Factory Defaults

When the 5Y leaves the factory, a set of values has been programmed into the user configuration. The user may restore these values at any time to their default settings.

Any user parameters you have previously set will be lost!

With the front panel

- 1) Access the user menu by holding START.
- 2) Choose item #10.
- 3) Press STOP.

With the keyboard

- 1) Press the ESC key to enter programming mode.
- 2) Type '0'.
- 3) Type 'yes' to confirm, or any key to cancel the request.

The factory default settings are:

| | | |
|--------------|---|------------------------------------|
| Valid # | = | 100 |
| Printer Type | = | 40 column |
| Graphs | = | Graphs & Data |
| Backoff | = | 3.0 millimeters |
| Delay | = | 0.5 seconds |
| Low limit | = | 1 N, or 0.1 Kp, Sc, or Lb. |
| High limit | = | 405 N, 40.5 Kp, 56.7 Sc, 108.6 Lb. |

* Note :

The High limit shown is for a 400 N machine. Refer to chapter 4.3 for details on 400, 500 and 800 newton plausibility limits.

3.6.11 Menu U 11. Limits for valid measurements (plausibility)

In this mode a high and a low limit for valid measurements can be set. Measurements which are outside of these limits will be marked on the printout and will not be considered for statistics.

With front panel

- 1) Press and hold START and activate User Menu.
- 2) Choose No. 11
- 3) Insert low limit plausibility value

- 4) Push STOP
- 5) Insert high limit plausibility value
- 6) With STOP you take the values over into the memory

With the keyboard

- 1) Enter with ESC into programming mode
- 2) Choose No. 11
- 3) Insert low limit plausibility value
- 4) Confirm with ENTER
- 5) Insert high limit plausibility value
- 6) Finish with ENTER

3.6.12 Menu U12: Setup Mechanical Tablets:

The Setup Mechanical Tablet function allows the operator to enter the value of their mechanical tablets (6 maximum) into the 5Y user memory. Thereafter, the operator only needs to select the correct test position in order to use this function and establish baseline operational data for the hardness tester.

With the Front Plate

1. Press and **hold** Start to access the user menu.
2. When the display shows "U 01", release the Start button.
3. Choose user menu item number 12. You do this by using the 1's and the 10's button to change the display so that it reads "U 12". Press and release the Start button. This will select menu item 12. The display will show:

1 XX

The "1" indicates that this is the first mechanical tablet to be tested. The "XX" indicates the Kp value of the first tablet to be tested.

4. Enter the Kp value of the first mechanical tablet to be tested. You do this by using the 1's and the 10's button to change the display. Press and release the Start button. The display will show:

2 XX

The "2" indicates that this is the second mechanical tablet to be tested. The "XX" indicates the Kp value of the second tablet to be tested.

5. Repeat this process for the number of mechanical tablets that you wish to test (6 maximum). Each time the Start button is pressed, the test position number located at the left of the display will increment. If you do not wish to enter a mechanical tablet value, do not alter the mechanical tablet value field (XX). Simply press and release the Start button.

NOTE: Nonzero mechanical tablet fields should be sequential starting with test position 1. A zero in any mechanical tablet field indicates that subsequent fields have not been used. Therefore, Mechanical Tablets Tests will terminate (U 13) when a zero is encountered.

6. After cycling through the 6 test positions, the display will return to either 00.0 or 000.

With the Keypad

1. Press "ESC". The keypad display will show the programming mode prompt:

Programming mode :
<RETURN> => Exit

2. Select the number 12 and press Enter. The keypad display will show:

Mechanical Tablet 1
Capacity (X)

Where X is the Kp value of the mechanical tablet in test position 1.

3. Enter the Kp value of the first mechanical tablet to be tested. After pressing Enter, the display will show:

Mechanical Tablet 2
Capacity (X)

Where X is the Kp value of the mechanical tablet in test position 2.

4. Repeat this process for the number of mechanical tablets that you wish to test (6 maximum). Each time the Enter button is pressed, the test position number will increment. If you do not wish to enter a mechanical tablet value, do not alter the mechanical tablet value field (XX). Simply press and release Enter.

NOTE: Nonzero mechanical tablet fields should be sequential starting with test position 1. A zero in any mechanical tablet field indicates that subsequent fields have not been used. Therefore, Mechanical Tablets Tests will terminate (U 13) when a zero is encountered.

5. After cycling through the 6 test positions, press Enter. This saves the entered value returns you to the programming mode prompt.

3.6.13 Menu U13: Run Mechanical Tablet Test:

The Run Mechanical Tablet Test function allows the operator to perform tests according to procedure recommended by Schleuniger. This procedure consists of a 20 cycle warm up, omitting the high and low values from the next 10 samples and taking the mean of the remaining 8 data points. At the completion of the test, the Units, the 5Y Serial Number, the Date, the Time and a place for the Operators Signature will appear on the report.

With the Front Plate

1. Press and **hold** Start to access the user menu.
2. When the display shows "U 01", release the Start button.
3. Choose user menu item number 13. You do this by using the 1's and the 10's button to change the display so that it reads "U 13". Press and release the Start button. This will select menu item 13. The report header will print and the display will show:

XXX

Where XXX is the value of the mechanical tablet in test position 1 (U 12).

4. To start the test for this mechanical tablet, Press and Release the Start button. The display will show:

XXXX

Where XXXX is the counter for the 20 cycle warm up.

The display will then show:

XXXX

Where XXXX is the counter for the 10 cycle mechanical tablet test.

After this test is complete, the display will show:

XXX

Where XXX is the value of the mechanical tablet in test position 2 (U 12).

5. To skip the test for this mechanical tablet, Press and Release the 1's button. The value of the mechanical tablet and the message "Test bypassed by operator" will print on the report. The display will show:

XXX

Where XXX is the value of the mechanical tablet in test position 2 (U 12).

6. Repeat as required. The display will continue to show the next non-zero value, for the mechanical tablet in the next test position, after either a test is completed

or a test has been skipped. However, when the mechanical tablet value is zero, the test will be terminated and the report will finish printing.

7. The display will now return to either 00.0 or 000.

With the Keypad

1. Press "ESC". The keypad display will show the programming mode prompt:

Programming mode :
<RETURN> => Exit

2. Select the number 13 and press Enter. The keypad display will show:

Capacity XX Kp,
push ENTER to run
test, ESC to skip

Where XX is the value of the mechanical tablet in test position 1 (U 12).

3. If you press ENTER, the 5Y display will show:

XXXX

Where XXXX is the counter for the 20 cycle warm up.

The 5Y display will then show:

XXXX

Where XXXX is the counter for the 10 cycle mechanical tablet test.

After this test is complete, the 5Y display will show:

XX.X

Where XX.X is the last hardness value for the value of the mechanical tablet that was previously tested.

The keypad display will show:

Capacity XX Kp,
push ENTER to run
test, ESC to skip

Where XX is the value of the mechanical tablet in test position 2 (U 12).

4. If you press ESC, the message "Test bypassed by operator" will print on the report. The display will show:

Capacity XX Kp,

push ENTER to run
test, ESC to skip

Where XX is the value of the mechanical tablet in test position 2 (U 12).

5. Repeat as required. The display will continue to show the next non-zero value, for the mechanical tablet in the next test position, after either a test is completed or a test has been skipped. However, when the mechanical tablet value is zero, the test will be terminated and the report will finish printing
6. The keypad will return to the programming mode prompt.

The following is a 40 column printout from a Mechanical Tablet Test. The Setup Mechanical Tablet (U 12) Function has been programmed so that 5, 10 and 15 Kp values are in test positions 1, 2 and 3 respectively. Both the 5 and the 10 Kp tests have been bypassed for demonstration purposes.

-----/\//-----\//\-----

Schleuniger Model 5Y
Mechanical Tablet
Calibration Verification

Test Procedure:

5Y must be set to Kp

Cycles 20 times
Records next 10 cycles
Eliminates highest and lowest
Calculates mean of remaining 8 values

5 Kp test

Test bypassed by operator

10 Kp test

10.0
10.0
10.0
9.9
10.0
10.0
10.0
10.1
10.0
10.0

Mean of remaining 8 = 10.0

15 Kp test

Test bypassed by operator

Units : Kp

Serial # :1161
Date : 21 November 2003
Time : 14:11

Signature:_____

-----\//\//-----\//\//-----

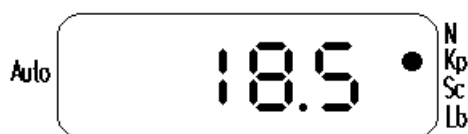
3.7 Selecting Operating Mode

The 5Y may be operated in AUTO or MANUAL mode.

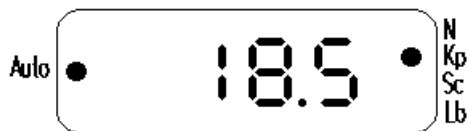
In MANUAL mode, each sample is tested individually. After a tablet is tested, the slide returns to the resting position. It will wait there indefinitely. The user must initiate the test for each sample by pressing START.

In AUTO mode, the slide returns to the resting position. It waits there for "testdelay" seconds, then the machine automatically begins another test. The operator can pause the test by pressing STOP, and resume the test by pressing START. This will not affect the accumulated results.

To toggle operating mode, press AUTO, or type 'a' on the keyboard. The RED light on the left of the display will be lit when the machine is in AUTO mode. You can toggle operating mode during a test.



Auto mode OFF (Manual Mode)



Auto mode ON (Automatic Mode)

3.8 Performing a Hardness Test



Let us go through an example of a hardness test. We will start testing in the manual mode, then switch to auto mode part way through the test.

Before you begin this test, you should restore the machine to its factory defaults. Configure the printer to 40 or 80 column, depending on which type you have.

Items needed for the test:

5 tablets or samples.

Dusting brush.

- 1) Turn the machine on, and have a set of 5 samples ready.
- 2) Turn on the printer, if you have one, and set the paper to the top of the page. Press RESET on the 5Y. "Reset" will be printed on the printer.
- 3) Set the number of valid measurements to 5. Refer to section 3.6, user menu item U 01.

- 4) Set the delay to 5.0 seconds.
Refer to section 3.6, user menu item U 08.

- 5) Place a tablet in the jaw.

- 6) Press 'a' on the keyboard or AUTO on the 5Y until the AUTO light is NOT lit. Thus, we are operating in Manual Mode.

- 7) Press START, or 's' on the keyboard.

The display will read 999, or 99.9, and the slide will move forward at full speed, after some delay. If a printer is attached, the header information will be printed out. If a keyboard or host is attached, the information will also be shown on the display.

- 8) When the slide contacts the tablet, it will retract the set backoff distance (in this case, 3 mm.), to the resting position.

- 9) The slide will come forward at slow speed, and break the tablet. It will retract to the resting position and stop.

- 10) Clean out the jaw with the dusting brush, and place another sample in the jaw.

- 11) Press START on the 5Y, or 's' on the keyboard.

- 12) The machine will test the next sample. The jaw will return to the resting position.

- 13) Now press AUTO, or 'a' on the keyboard. The AUTO light will light up. The machine is now in Auto Mode.

- 14) Replace the sample (we are on sample #3).

- 15) Press START, or 's' on the keyboard. Be ready to clean the jaw and replace the sample after this test.

- 16) After the sample is measured, clean out the jaw with the dusting brush, and replace the sample with another. After 5 seconds, the machine will automatically begin the next test.

- 17) Repeat number 16.

- 19) We have now tested all 5 samples, and the machine will stop.

- 20) The statistics will be printed. Five data points and a histogram will be plotted, along with their data.

- 21) Optionally, you can press RESET. This brings the slide all the way to the left.

You do not have to press RESET between sets of measurements. If you are testing samples of similar diameter, you can just press start. The test will commence from the resting position.

This completes the test. If you wish to stop during testing in auto mode, just press STOP. You can either continue the test in auto or manual mode, or press STATISTICS (or 't' on the keyboard) to complete the test if the number of valid samples has not been reached.

3.9 Printing the Statistics

Once you have taken at least one (1) *valid* measurement, you can print the statistical information.

There are two possible times when you can get statistics:

The first is when the number of valid measurements has been reached. In this case, the statistics will be printed automatically.

The second case occurs in the middle of a set of measurements. That is, if you have not yet tested the number of valid measurements configured in the 5Y, and the machine is paused between measurements.

Once you have pressed statistics, the sample data is lost, and the 5Y will prepare for a new test.

If you are in the middle of a set of measurements:

In automatic mode:

- 1) In Auto mode, press STOP to suspend the test.
- 2) Press STATISTICS.

In manual mode:

- 1) Simply press statistics.

This will force the statistics to be computed and printed, and will end the test in progress.

4 Appendix

4.1 Keyboard and Host-Terminal Functions

| <u>Key</u> | <u>Function</u> |
|------------|--|
| ESC | Enter Programming Mode |
| F1 (n) | Product Name (Up to 23 characters) |
| F2 (#) | Product Number (Up to 23 characters) |
| F3 (b) | Batch (Up to 23 characters) |
| F4 (c) | Comment (Up to 23 characters) |
| F5 (l) | Low Limit range: 0 to maximum units for machine and scale |
| F6 (h) | High Limit range: 0 to maximum units for machine and scale |

While in programming mode the user menu functions can be activated by pressing the appropriate number on the keyboard:

| <u>User Menu#</u> | <u>Function</u> |
|-------------------|----------------------------------|
| 1 = | Set Number of Valid Measurements |
| 2 = | Set Date and Time |
| 3 = | Calibrate |
| 4 = | Verify Calibration |
| 5 = | Set Printer Type |
| 6 = | Set Graphs Mode |
| 7 = | Set Backoff Distance |
| 8 = | Set Delay |
| 9 = | Print Configuration |
| 10 = | Restore Factory Defaults |
| 11 = | Plausibility limits |
| 12 = | Setup Mechanical Tablets |
| 13 = | Run Mechanical Tablet Test |

CTRL-C (press Ctrl and then press C): Initialize data. Sets Product Name, Product Number, Batch, and Comment to "_____", low limit to minimum and high limit to maximum.

During Normal Operation "Manual" (ie. not programming mode.)

| | | |
|---|---|-------------------------------|
| a | - | Toggle AUTO/MANUAL Mode |
| s | - | Start a Test |
| t | - | Finish Test, Print Statistics |

During Normal Operation "Auto" (ie. not programming mode.)

| | | |
|---|---|--|
| a | - | Toggle AUTO/MANUAL Mode |
| s | - | Start a Test |
| t | - | Finish Test, Print Statistics (press s first to stop the test) |

4.2 Panel Button Functions Table

| BUTTON: | Action | Action | During Number Setting |
|------------|-------------------|----------------------|-----------------------|
| | Press and Release | Press and Hold | |
| RESET | RESET | RESET | RESET |
| STATISTICS | Print Statistics | Reset Teststamp to 1 | Increment 10's Digit |
| AUTO | Toggle Mode | Print Help | Increment 1's Digit |
| START | Start Test | User Menu | Done Setting |

4.3 Unit Scales

The 5Y unit scales are computed using the following factors.

| | |
|-------------------|----------------------|
| Newton: | 1 Kp = 9.81 N |
| Kiloponds: | 1 Kp = Force of 1 Kg |
| Strong Cobb : | 1.4 Sc = 1 Kp |
| Pound Apothecary: | 1 Lb = 0.373 Kp |

| Min | / | Max | - for 400 Newton Machine: |
|-----|---|-----|---------------------------|
|-----|---|-----|---------------------------|

| | | | |
|-----|---|-------|--------------|
| 1 | / | 405 | Newtons |
| 0.1 | / | 40.5 | Kiloponds |
| 0.1 | / | 56.7 | Strong Cobbs |
| 0.1 | / | 108.6 | Pounds |

| Min | / | Max | - for 500 Newton Machine: |
|-----|---|-----|---------------------------|
|-----|---|-----|---------------------------|

| | | | |
|-----|---|-------|--------------|
| 1 | / | 505 | Newtons |
| 0.1 | / | 50.5 | Kiloponds |
| 0.1 | / | 70.7 | Strong Cobbs |
| 0.1 | / | 135.4 | Pounds |

| Min | / | Max | - for 800 Newton Machine: |
|-----|---|-----|---------------------------|
|-----|---|-----|---------------------------|

| | | | |
|-----|---|-------|--------------|
| 1 | / | 805 | Newtons |
| 0.1 | / | 80.5 | Kiloponds |
| 0.1 | / | 112.7 | Strong Cobbs |
| 0.1 | / | 215.8 | Pounds |

4.4 Technical Information

General

| | |
|----------------------|--|
| Physical Dimensions: | 150 x 420 x 185 mm. (38-1/2" x 107-1/2" x 47-1/2") |
| Weight: | 10 Kg (21 lb.) |
| Power Supply: | 110/220 V, 50/60 cycles, auto-switch. |
| Hardness Range: | 300 Newtons (+/- 1% of full scale) 400 Newtons (+/- 2% of full scale) 500 Newtons (+/- 3% of full scale) |
| Sample Diameter: | 33 mm. (max) |
| Cycle Time: | 25 Tablets / 3 minutes (typical) |

Control System

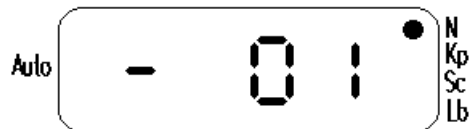
| | |
|-----------------|---|
| Communications: | 15-pin keypad TTL (not configurable) 1200 baud, 8 bits, No Parity |
| | 25-pin host-terminal RS232 (not configurable) 1200 baud, 8 bits, No Parity |
| | 25-pin printer RS232 (baud rate configurable) 4800 baud, 8 bits, No Parity |

4.5 Error Conditions

The 5Y system can detect the following errors or system conditions upon RESET or Power-Up. Each message is displayed for 5 seconds, along with a message on the printer and host terminal.

It is unlikely you will ever encounter these errors. However, in the event you do, this information will be useful.

Display:



Printed Message:

SYS MSG: CAL

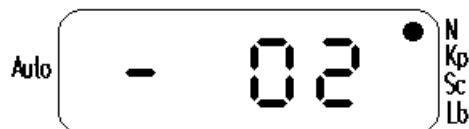
Explanation:

The calibration factor contains a value which is not likely to be valid. This can be caused by RAM battery being low or dead, changing components on the circuit board, or by someone un-calibrating the machine.

Solution:

You must re-calibrate the machine. See section 3.6, menu item #3, for the calibration procedure.

Display:



Printed Message:

SYS MSG: #VAL

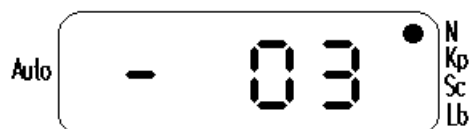
Explanation:

The variable containing the number of valid measures is less than 1 or greater than 100.

Solution:

Set the number of valid measurements to a value in the range of 1 to 100. Refer to section 3.6, menu item #1 for the procedure.

Display:



Printed Message:

SYS MSG: L.C.

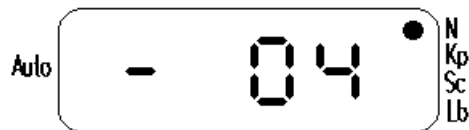
Explanation:

The load cell offset, taken at machine reset, with no load applied, is a value which is not within acceptable levels.

Solution:

Call Dr. Schleuniger Pharmatron for service.

Display:



Printed Message:

SYS MSG: PRNT

Explanation:

The value for printer configuration contains an invalid value.

Solution:

Select the correct value for your printer configuration:

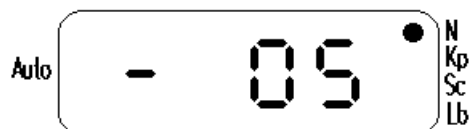
0 = no printer

1 = 40 column printer

2 = 80 column printer

User menu #5 is used to set the printer type. See section 3.6.

Display:



Printed Message:

SYS MSG: INIT

Explanation:

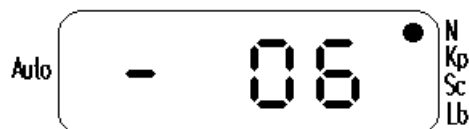
The system has detected that the RAM has not been correctly initialized. This usually happens when the RAM is first installed. This message is given to tell the operator that the RAM is being initialized.

Solution:

There is no need to correct this error.

The 5Y automatically initializes the RAM, and resets Factory Defaults.

Display:



Printed Message:

SYS MSG: UNIT

Explanation:

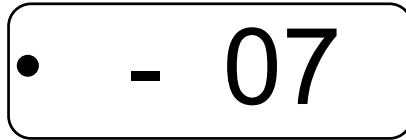
The units switch on the back of the machine has been changed, and a hardware reset has occurred (ie. RESET button was pressed the 5Y was Powered-OFF/ON)

Solution:

There is no need to correct this error.

The lower and upper limits are set to the minimum and maximum from the tables given in Appendix C.

Display:



Printed Message:
SYS MSG: SPEED

Explanation:

The information in the motor data speed registers is invalid.

Solution:

Turn the 5Y OFF and ON again. Wait for the display going blank. Then press the CALIB button. Enter Menu U04. Press START again, the display will show 00.00. At this point press the 2 middle keys (10's and 1's) simultaneously. The slide will move forward and backward several times and set the correct motor speeds automatically. After this process has been completed press the RESET button.

If one of the above conditions is detected, the 5Y will display a dash (-) followed by the error number. The message will be displayed for 5 seconds. If multiple conditions are detected, each message will be displayed in sequence. If possible, the message will be printed on the serial printer, and displayed on the host/terminal or keyboard.

The conditions above can occur for a variety of reasons. Sometimes the battery backed RAM information may be lost due to a low battery, or static discharge (from touching the circuit board, for example). The load cell circuit may become detached, or the load cell may have been damaged.

* Note:

At present, if error 1 (CAL) or error 3 (L.C.) occurs, the system will be partially disabled to prevent damage to the load cell. The display will be blanked, and tests can not be performed. In this case, the following procedures are suggested:

Error - 01:

- 1) Wait for the display to be blanked.
- 2) Press CALIBRATE.
- 3) Hold START to access the user menu.
- 4) Select item #3, calibration, to calibrate the machine. You must have a calibration kit to do this. If you don't, call SPI for service.

Error - 03:

Call Dr. Schleuniger Pharmatron AG, Switzerland +41 (0)32 624 40 80 for service or contact your local agent.

4.5.1 Trouble Shooting

Printer is not Printing:

- a. Cable is not connected properly

Solution:

- Check cable connection.
- b. Power is off on printer.
Solution:
Check printer.
- c. Printer DIP switches are not configured correctly.
Solution:
See printer setup section and printer manual.

Printer prints incorrectly:

- a. Printer DIP switches are not configured correctly.
Solution:
See printer setup section and printer manual.
- b. Printer type in the 5Y configuration is incorrect.
Solution:
Set correct printer type in user menu.
- c. Printer is not Epson compatible.

5Y display is blank:

- a. 5Y power is off.
Solution:
Check 5Y power.
- b. Power cable is not connected.
Solution:
Check power cable.
- c. A system error has occurred
Solution:

Press Reset and observe error conditions. Then, follow the procedure in the ERRORS section above.

Press CALIBRATE once to continue operation.

5Y slide will not move:

- a. 5Y power is off.
Solution:
Check 5Y power.
- b. Peripheral printer or host is not communicating.
Solution:
Check peripheral configuration.
- c. 5Y is printing or processing data.
Solution:
Wait until processing is finished, or press RESET.
- d. 5Y is in programming mode.
Solution:
Exit programming mode by pressing ENTER on keyboard.

No graphs are printed:

- a. Graphs are set to OFF (0).
Solution:
Set graphs to (1) or (2). (User menu #6)
- b. Printer type is set to OFF (0).
Solution:
Set printer type to (1) or (2). (User menu #5)
- c. 5Y is older version, which doesn't have graphics (not 4.11).

Solution:

Version 4.11 is available from Schleuniger.

d. No valid measurements were taken.

Solution:

Check plausibility (low/high) limits.

Pressing panel buttons has no effect:

a. 5Y is printing or processing data.

Solution:

Wait until processing or printing is finished, or press RESET.

4.6 Sample Statistical Printout

```

* TABLET HARDNESS TESTER 5Y - 4.22 *
(C) 1993-04 Schleuniger Pharmatron, Inc.

Product   :                               Productnr:
Batch     :                               Comment  :
Date of calibration : Jul 11, 2003      Date: Nov 6, 2003      Time: 14:13
Amount    : 30      Low limit: 41      High limit: 65      Unit: N
Serial #   : 1449

      n :      1      2      3      4      5      6      7      8      9      10
      0 :      50      50      50      50      36      50      50      50      50      50
      10 :      50      50      108      50      50      50      50      50      50      50
      20 :      50      50      36      50      50      50      50      50      50      50
      30 :      50      50      50

Teststamp #: 100
Statistics: 30 Valid values.
sum(Xi)/n.....: 50.0 N
Xmax.....: 50.0 N
Xmin.....: 50.0 N
Xmax-Xmin: 0.0 N
Sabs.....: 0.0 N
Srel.....: 0.0 %

Teststamp #: 100
Serial #: 1449
Test Finished At: 14:17

```

5 GLOSSARY OF TERMS

This section gives brief descriptions of some of the terms used in this manual.

Automatic Mode:

In automatic mode, the 5Y will press a sample, and the slide will retract to the *resting position*. After *test delay* seconds, the 5Y will test another sample. Automatic mode may be toggled before a test, or while the machine is paused between individual samples.

Backoff Distance:

The distance in millimeters added to the true tablet diameter to determine the *resting position* between samples.

Baud, Baud Rate:

The number of bits-per-second sent, or received, on a serial line. The American National Standards Institute (ANSI) has defined several speeds for baud. For example, 300, 1200, 2400, 4800, 9600, and 19200 baud are typical. Both sides of a serial communications link need to be set to the same baud rate to ensure proper data transmission.

Bit:

A digit in the binary number system which can either be a 0 or a 1.

Byte:

A set of 8 bits, which correspond to 1 character of information. A byte can represent the decimal integers from 0 to 255.

Calibration:

A method of obtaining a relationship between two known scales. The 5Y uses Kilograms as the calibration scale, and the load-cell voltage as the measuring scale. Two load cell output values are taken, one at zero (tare), and one at 5 kilograms. These values are used to calculate a scaling factor, which is later used to determine a measurement.

DIP Switch:

A dual in-line package switch. These are usually mounted on a circuit board with electronic parts. The package has an arbitrary number of small switches on it. These switches can be toggled using a small pointed object, such as a ball point pen. Using a pencil is NOT recommended, since the carbon in the pencil may cause problems in the switch mechanism.

Dumb - Terminal:

Similar to a host-terminal, a dumb-terminal is one side of a communications link. However, in contrast to a host-computer, a dumb terminal can not run programs.

Hard Reset:

This term refers to a return of the electronic system to a known state. The hard reset is not governed by software control, but depends on the electronic hardware.

Host Port:

The physical connection where a cable or wires are attached for communication to the host terminal. This is an I/O port.

Host Terminal:

A device, such as a computer, which acts as one side of a communication link between two machines. The host terminal gathers bits of information from the 5Y and presents them to a person in an understandable manner.

Input/Output (I/O) Port:

The socket, wire, or other mechanical connection that allows information to be passed in and out of a machine. The information is sent and received in a pre-defined manner. See *baud rate*, *parity*, and *bits*.

Kiloponds:

The units of force associated with 1 Kilogram of mass.

Load - Cell:

An 'S' beam with attached strain gauges, whose electrical properties change depending on the force applied to it. The electrical resistances of the strain gauges vary when force is applied to the beam.

Manual Mode:

In manual mode, the 5Y will press a sample, and the jaw will return to the resting position. It will pause indefinitely. The operator must press START to cause the next sample to be pressed.

Mean:

The statistical term for the sum of all samples divided by the number of samples. The mean is defined by the following equation, where X_i are the sample values, and n is the total number of samples. The 5Y shows this values as "sum(X_i)/ n "

$$X_{ave} = \frac{\sum_1^n X_i}{n}$$

Micro-Processor:

A single integrated circuit "chip," which combines many complicated functions into a single device. It is designed to perform simple instructions at a very high rate. The micro-processor is the "brain" of the 5Y, which controls all of the machine's operations.

Modem:

Short for modulator-demodulator, a modem converts digital signals to audio and back again. This allows digital signals to be sent over a telephone line, which is designed to transmit voice information.

Newtons:

The units of force in S.I. (system international) units corresponding to mass in kilograms times acceleration in meters per second squared.

Parity:

An error detection (not correction) technique used in serial communications, which is done by sending additional bits of information.

Peripheral:

A device which is remotely connected to a main processor or machine.

Plausibility:

The term used to describe whether a value is reasonable. The plausibility limits are defined by the lower and upper limits for valid measurements.

Pounds Apothecary:

An English measuring unit, corresponding to 0.373 Kg.

Prompt:

An indication from a computer, or machine, that information should be entered at this time.

Range:

The difference between the minimum value and the maximum value in a set of measurements.

Resting Position:

The slide position when the machine is paused between individual samples.

Serial:

A term used in electronic communications when referring to the transmission of information one bit at a time. It allows fewer wires to be used to communicate, whereas parallel communications use many wires, and send many bits of information simultaneously.

Standard Deviation (absolute):

The statistical term giving average of the distance of the points from the mean. The 5Y shows this term as "Sabs". The standard deviation is computed by the formula

$$\sigma_{abs} = \sqrt{\frac{\sum_{i=1}^n (X_i - X_{avg})^2}{(n-1)}}$$

Standard Deviation (relative):

A ratio of the absolute standard deviation to the mean. The 5Y shows this term as "Srel". The formula for the relative standard deviation is

$$\sigma_{rel} = \frac{\sigma_{abs}}{X_{ave}}$$

Strong Cobbs:

The unit of force derived from the Strong - Cobb machine. It is provided, typically, for companies that wish to maintain consistent records using the Sc. units. (1.4 Sc. = 1 Kg.)

Test Delay:

The wait between tests when the 5Y is in automatic operating mode.

Toggle:

To switch a value to its other state. For example, an on-off switch is *toggled* from off to on.

TTY:

Teletype. This is a holdover from the days when computer information was presented on automatic typewriters. Today, a Teletype can also be a cathode ray tube (CRT) display, like a television screen.